National Institute of Environmental Health Sciences

# Modelling the effect of temperature on transmission of dengue

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**Year:** 2010
**Journal:** Medical and Veterinary Entomology. 24 (1): 66-73

**Abstract:**

The main entomological parameters involved in the rate of dengue virus transmission include the longevity of female mosquitoes, the time interval between bites and the extrinsic incubation period of the virus. Field and laboratory data provide estimates for these parameters, but their interactions with other factors (e.g. host population density and environmental parameters) make their integration into a transmission model quite complex. To estimate the impact of these parameters on transmission, we developed a model of virus transmission by a vector population which predicts the number of potentially infective bites under a range of temperatures and entomological parameters, including the daily survival rate of females, the interval between bites and the extrinsic incubation period. Results show that in a stable population, an increase in mosquito longevity disproportionately enhances the number of potential transmissions (e.g. by as much as five times when the survival rate rises from 0.80 to 0.95). Halving the length of the biting interval with a 10-°C rise in temperature increases the transmission rate by at least 2.4 times. Accordingly, the model can predict changes in dengue transmission associated with short-term variation in seasonal temperature and also with potentially long-lasting increases in global temperatures.

**Source:** http://dx.doi.org/10.1111/j.1365-2915.2009.00848.x

## Resource Description

**Early Warning System:**

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

**Exposure :**

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

**Temperature:** Fluctuations

**Geographic Feature:**

resource focuses on specific type of geography

None or Unspecified

**Geographic Location:** ☑

resource focuses on specific location

Global or Unspecified

**Health Impact:** ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

**Infectious Disease:** Vectorborne Disease

**Vectorborne Disease:** Mosquito-borne Disease

**Mosquito-borne Disease:** Malaria

**Mitigation/Adaptation:** ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

**Model/Methodology:** ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

**Resource Type:** ☑

format or standard characteristic of resource

Research Article

**Timescale:** ☑

time period studied

Short-Term (

**Vulnerability/Impact Assessment:** ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content